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(54) **Title:** A METHOD AND DEVICE FOR ACCESSING SERVICES AND FILES
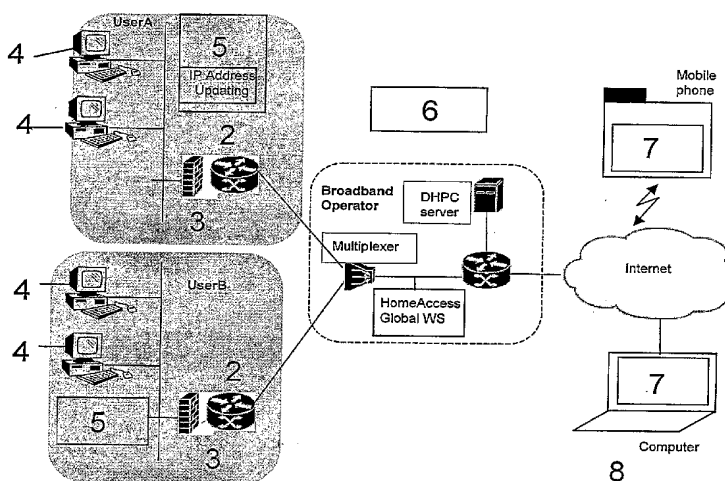
(57) **Abstract:** The present invention relates to a method and device for accessing services and files on a computer (4) in a home network (1) from a stationary or mobile device (8, 9) outside said local network Said local network is equipped with a networked file system, and said stationary or mobile device is able to communicate with said local network over a wide area network. For any networked file system message that is to be transmitted over said wide area network, at least some fields of said networked file system message are mapped into corresponding fields in an XML message representing said networked system message. Any XML message that is received over said wide area network, said XML message is parsed, and if said XML message represents a networked file system message, a networked file system message is reconstructed by mapping each field of said XML message into a corresponding field of said reconstructed networked file message.

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A METHOD AND DEVICE FOR ACCESSING SERVICES AND FILES

Field of the invention

The present invention relates to data communication
systems, and in particular the access and use of files and
5   services residing on a local network computer system from
remote computers, Personal Digital Assistants (PDA) or
mobile phones.

Technical background

Nowadays, more and more households are acquiring broadband
10 Internet connections to their home. On the home local
network they may have several computers running various
services and hosting private documents and files. It is
hence quite desirable to be able to access these services
and files from outside their home via stationary computers
15 or mobile devices like cellular phone or PDA.

Unfortunately, to be connected to the Internet does not
bring only advantages but also drawbacks. The user home
networks as other networks connected to the Internet are
exposed to fraudulent attacks and misuses. For protection
20 against frauds and intrusions, more and more users are
installing firewalls. While protecting the user home
network, the firewalls may also prevent the legitimate
users to access their files and services located on the
user home network.

25 In order to establish a secure connection to a local
network from outside, solutions such as Virtual Private
Networks (VPN) can be used. The firewall of the local
network is configured to also operate as a VPN server, and
the mobile device could be used as a VPN client to connect
30 to this VPN server. Having connected to this server, the
mobile device becomes part of the local network that
resides behind the firewall/VPN server. This Virtual

Network (realised with an encrypted tunnel) will allow
traffic of any service to flow back and forth between the
local network and the mobile device.

The VPN solution has, however, many limitations. The VPN
5   solution requires high resource consumption in terms of
processing power and network bandwidth, which is usually
not available in mobile devices and wireless networks.

Another drawback is that it takes times to start up a VPN
and it does time out when there is no activity. This is not
10 convenient for the mobile user that sporadically accesses
his home network.

These limitations call for a simplified solution which can
adapt to both user's technical skills and the resource
constraints in networks and devices.
15

Summary of the invention

The present invention provides a solution for accessing
services and files residing on a computer in a local
network from stationary or mobile devices outside said
20 local network without compromising security.

The invention requires only minimal technical skills to
take into use. All that is needed is to download and
install an application on the computer where services
reside (in the home network), as well as to download and
25 install a client on the device in use.

In addition, the invention allows several (all) computers
on the local network to provide services, thus every person
having their own computer can access their own personal
services from their mobile device.

The scope of the invention appears from the appended patent claims.

In particular, the present invention relates to a method for providing access to services and files on a computer in a local network from a stationary or mobile device outside said local network. Said local network is equipped with a networked file system, and said stationary or mobile device is able to communicate with said local network over a wide area network. For any networked file system message that is to be transmitted over said wide area network, at least some fields of said networked file system message are mapped into corresponding fields in an XML message representing said networked system message. Any XML message that is received over said wide area network, said XML message is parsed, and if said XML message represents a networked file system message, a networked file system message is reconstructed by mapping each field of said XML message into a corresponding field of said reconstructed networked file message.

The invention also relates to a device for providing access to services and files on a computer in a local network, from a stationary or mobile device outside said local network. Said local network is equipped with a networked file system, and said stationary or mobile device is connected to said local network over a wide area network. Said device is adapted to map at least some fields of a networked file system message to be transmitted over said wide area network into corresponding fields in an XML message representing said networked file system message. Said device is further adapted to parse a XML message received over said wide area network, and if said XML message represents a networked file system message to reconstruct a networked file system message by mapping each field of said XML message into a corresponding field of said reconstructed networked file message.

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Brief description of the drawings

The invention will now be described in detail in reference to the appended drawings, in which:

Figure 1 illustrates the overall architecture of a mobile
5   home access system according to the present invention,

Figure 2 shows a solution for a local network with dynamic global IP address,

Figure 3 and 4 shows a solution for a local network with permanent or dynamic local IP address,

10   Figure 5 shows the interfaces of the home access local Web service according to the invention,

Figure 6 is a sequence diagram illustrating how one request from a home access Web service client invokes several requests and responses between the home access local Web
15   service and the file system,

Figure 7 is a sequence diagram showing the messages passing using the authentication interfaces.

Detailed description

Figure 1 depicts a typical home broadband connection to the
20   Internet. The underlying network technologies can be xDSLs or cable TV. As shown in Figure 1, a local network 1 may comprise several computers 4 and devices. It is connected to a broadband router 2, e.g an ADSL terminating Unit Router (ATU-R), which may provide DHCP and NAT (Network
25   Address Translation). A firewall 3 should be installed to protect the network 1 against intruders. Such a firewall 3 can also be incorporated in the broadband router 2 or LAN/WLAN router. The broadband router 2 is its turn connected to a multiplexer, e.g. Digital Subscriber Loop

Access Multiplexer (DSLAM). As shown in Figure 1, both DHCP
and NAT functions may also be carried out in the broadband
operator network.

The solution according to the present invention will allow
5   access to any files or services residing on computers 4 on
a LAN 1 behind a firewall 3, typically a private Local Area
Network (LAN). The solution as shown Figure 1 consists of
three components:

- A Home Access Local Web Service 5 that is installed on
10   the PC to provide access to files and services

- A Home Access Global Web Service 6 addressable by a
     global IP address

- A Home Access Web Service Client 7 that is installed
     on the terminal(s) 8, 9 used to access files and
15   services

Based on the nature of the local network IP address, there
are four different configurations:

Case 1: Local network using permanent global IP address

In this case, the Mobile Access to local network solution
20   does require only two components:

- Home Access Local Web Service 5

- Home Access Web Service client 7

The Home Access Web Service client 7 interacts with the
Home Access Local Web Service 5 to allow the user to access
25   his files and services on his local network.

Case 2: Local network using dynamic global IP address

In this case, the Mobile Home Access requires all the three components:

- Home Access Local Web Service 5

- Home Access Global Web Service 6

5
- Home Access Web Service Client 7

The Home Access Local Web Service 5, in addition to the functions as described in case 1 must be equipped with the following functions:

- IP address discovery and updating

10   The Home Access Web Service Client 7 must be equipped with the following function:

- Home Access Local Web Service discovery

As shown in Figure 2 the Home Access Local Web Service 5 is communicating with the Home Access Global Web Service 6 to
15   update its current IP address. The Home Access Web Service Client 7 can then interact directly with the Home Access Local Web Service 5 to access the files and services on the local network.

Case 3: Local network using permanent local IP address

20   In this case, illustrated in Fig. 4, the Mobile Home Access requires all the three components as in case 2. However, the Home Access Global Web Service 6 must be located in the broadband operator domain. It has the same interfaces as the previously described Home Access Global Web Service 6,
25   but in addition it provides the same interface for file and service access as the Home Access Local Web Service 5.

To access a file or a service located on his local network
1, the user issues a command to the Home Access Web Service
Client 7. The Client 7 will invoke the appropriate method
on the Home Access Global Web Service 6, which has a
5   permanent URI. Some of the input parameters should be
subscriber_id and *password*.

Upon successful authentication, the Home Access Global Web
Service 6 will invoke appropriate methods on the Home
Access Local Web Service 5 residing on the user's local
10   network 1. It is worth noting that the Home Access Global
Web Service 6 must know the local network's IP address and
use it to invoke methods on the Home Access Local Web
Service 5. The approach for acquiring the Home Access Local
Web Service IP address is the same as previously described
15   in case 2.

Case 4: Local network using dynamic local IP address

In this case, also illustrated by the fig. 4 drawing, the
solution has a configuration which is similar to the case
3. The Home Access Global Web Service 6 needs to find the
20   current IP address of the local network 1 which is now
dynamically allocated.

Functionality of the components

Home Access Local Web Service

The role of the Home Access Local WS 5 is to expose the
25   relevant operations of the native file system on the World
Wide Web such a mobile client 8, 9 can use them to access
files and services located within the local network 1.

As shown in Figure 4, the Home Access Local Web Service 5
has three interfaces:

30   • The Native File interface 10

8

- The Web Service File interface 11

- The Administrative interface 12

In addition to the file access functionality the Home
Access Local Web Service 5 has also the functionality to
periodically query the IP address of the local network 1
and uploads it to the Home Access Global Web Service 6 or a
defined globally accessible storage area.

The Native File interface

At the local network, there could be several users sharing
several heterogeneous computers and peripheral devices. It
is assumed that the local network is equipped with a
networked file system that allows the users to view and to
access remote files located on other computers from one
computer. Examples of such a networked file system can be
Sun Network File System (NFS) [1] [2] or Common Internet
File System (CIFS) [3]. However, only CIFS will be
considered further since it is incorporated in Microsoft
Windows that are installed in most private households.

CIFS is a file sharing protocol. Client systems use this
protocol to request file access services from server
systems over a network. It is based on the Server Message
Block (SMB) protocol widely in use by personal computers
and workstations running a wide variety of operating
systems.

The protocol supports the following features:

- File access

- File and record locking

- Safe caching, read-ahead, and write-behind

- File change notification

- Protocol version negotiation

- Extended attributes

- Distributed replicated virtual volumes

5   • Server name resolution independence

- Batched requests

- Unicode file names

Although CIFS is independent of the transport layer, the
common transports today across this interface is through
10   NBT (NetBIOS over TCP) or across raw TCP connections.

Raw TCP transport

This mode of operation is the simplest, where SMB messages
can be sent immediately to port 445 on the server. Based on
the response to a TCP connection request to this port, and
15   possibly a reply to the SMB message, either RAW transport
can used further or an NBT session can be initiated as
described below.

NBT transport

In this mode, additional messages must be sent to gain
20   access to the file server and to initiate a session. Also,
a valid NetBIOS name of the file server is needed in the
message that requests a new session. The need for NBT
support completely relies on the servers that should be
supported and whether these are expecting correct NBT
25   semantics.

The Web Service File Interface

Since the goal is to enable file and service access from
outside devices, especially mobile phones, which have
several limitations, the requirements on the Web Service
Interface are as follows:

5   • It should support both regular computers and limited
           mobile devices

         • It should be capable to adapt itself to the device
           type

         • For mobile phones with physical limitations in terms
10   of storage, processing, small display, etc. the
           operations/methods should be rich such that only few
           operations are required to accomplish a task.

To cope with these requirements the Web Service File
Interface consists of the following sub-interfaces:

15   • Authentication Interface

         • Administration Interface

         • Tunnelling Interface

         • Reduced Mapping interface

Before allowing access to home files and services, it is
20   important that the identification, authentication and
authorisation are carried out properly. The Web Service
File Interface must have an Authentication Interface.

The Tunnelling Interface is more suitable for access from
remote personal computer, which has a CIFS client
25   installed. The Reduced Mapping Interface is intended
formobile devices with limited capabilities.

Authentication Interface

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This interface controls identification, authentication and authorization to shared resources.

IAUTHMustAuthenticate(Challenge) – This method is used to notify the client that it is required to authenticate
5   itself prior to accessing any resources through the service access point. This method can be used as a response to any type of request from an unauthenticated client.

IAUTHAuthenticateRequest(Credentials) – This method is used by the client to request authentication by providing proper
10 credentials.

IAUTHAuthenticateResponse() – This method is used by the service access point to notify the client about the outcome of the authentication process.

The Administrative Interface

15 Access to administration methods requires successful authentication through the interface described earlier. The administrative interface can be used both from remote clients as well as from clients on the local network which could be an administration application.

20 The Administrative Interface allows a user to specify:

- What directories on the home computer(s) should be made accessible to remote devices

In addition it allows a System Administrator to configure:

- User accounts

25 *IADMListHosts()* – Lists all hosts on the local network

IADMListUsers() – Lists all registered users

IADMListDirectoriesOnHost(String host) — Lists all
accessible directories on the specified host

IADMSetAccessRights(URI resource, Int accessrights) — Sets
the specified access rights on the specified file or
5   directory

IADMGetUserConfiguration(String user_id) — Retrieves the
specified user's configuration

IADMSetUserConfiguration(String user_id, Configuration c) —
Sets the specified user's configuration

10 Each user's access rights to resources and preferences are
controlled through two methods (*IADMGetUserConfiguration*
and *IADMSetUserConfiguration*). By defining a generic method
which passes the configuration as a parameter to the Home
Access Local Web Service, maximum flexibility is achieved,
15 and new features can easily be added later on.

A Configuration contains at least the following
definitions:

1. Definition of access rights (readable, writable or
both) to specific files and directories

20   2. For each resource it should be possible to define
which component of the resource is available (offset,
length etc.)

3. Definition of access rights and format/presentation
from specific device or group of devices

25   4. Definition of access rights from specific IP-
addresses, subnets or domains

5. Definition of access rights by specific users and
groups of users

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Tunnelling Interface

In tunnelling mode, a complete CIFS message is encapsulated
in a Simple Object Access Protocol (SOAP) message by the
Home Access Local Web Service using binary attachments. At
5   the Web Service client side (on the terminal), the CIFS
content is extracted from the SOAP message and exposed
through a CIFS server. This way, an ordinary CIFS enabled
browser (e.g. Windows Explorer) can be used to access the
remote file system.

10   There are basically two approaches to embedding binary data
into SOAP messages.

The first approach is to use the XML CDATA element type for
embedding the CIFS message into the XML message. The
drawback of this solution is that the data must be base64
15   encoded to avoid the content conflicting with e.g. the
terminating CDATA tag. Using base64 encoding results in an
increase in size of 1/3 of the original size. For SMB
messages containing only signalling information, this might
not be a problem, but for the messages containing file
20   contents it is.

The other approach is to use SOAP with Attachments (SwA)
[4][5][6], but this is not yet supported by all SOAP
platforms. It is however supported with JAX-RPC [7] through
SAAJ [8]. SwA will, utilising one of the referenced
25   specifications, be supported by all SOAP platforms in the
near future.

Also, the client application exposing the file system is
required to authenticate itself towards the service access
point before access to the remote file system is granted
30   and the file system can be exposed. Except for this
authentication process, all other commands follow the
network file system protocol.

The Tunnelling Interface has two methods:

ITUNReqCommand(CIFSAttachment) – Transports a complete
request command from client to host with network file
system

5   *ITUNResCommand(CIFSAttachment)* – Transports a complete
response command from host with network file system to
client

Reduced Mapping Interface

Every CIFS message can be replaced by a corresponding SOAP
10 message. In theory, each field of a CIFS message could be
mapped into an entry of a SOAP message by the Home Access
Local Web Service. At the client side (terminal), the SOAP
message is parsed and the original CIFS message
reconstructed and exposed through a CIFS server. However,
15 such a full mapping scheme introduces a lot of overhead and
it is not sure that the mobile device is capable to receive
and process all the data that it gets. A reduced mapping
scheme is more efficient and has the following advantages:

* Reduces the content of each message

20 * Reduces the number of total messages

* Reduces the requirements on the mobile device; there
   is no need for a complete CIFS client on the device,
   but only a client which supports the specified
   methods.

25 Only the most important parts of native network file system
messages are mapped to an XML format. In addition, a set of
management interfaces that are used between the client and
the service access point, are defined.

These interfaces control connection establishment towards
shares, as well as maintenance of sessions and teardown of
connections.

*IACCListResources(URI uri, String pattern, Boolean
recursive)* – Lists all resources on the specified URI
matching the specified pattern. If pattern is left empty,
all resources on the specified URI are listed. Setting
recursive to true allows this method to be used for
searching for specific named resources throughout the
entire tree defined by uri.

IACCReadResource(URI uri) – Reads the contents of the
specified resource as specified in the user configuration
described previously. This method incorporates several
methods of the network file system, such as protocol
negotiation, session setup etc., see the enclosed example.

IACCWriteResource(URI uri, WriteSpecification ws) – Writes
to the specified resource the content specified by ws (e.g.
create/offset/append, data, length etc.). This method
incorporates several methods of the network file system,
such as protocol negotiation, session setup etc., see the
enclosed example.

Home Access Global Web Service

The Home Access Global Web Service is required for the
three cases:

- Dynamic global IP address

- Permanent local IP address

- Dynamic local IP address.

It is collaborating with several Home Access Local Web
Services belonging to different users. It must have a list

of users to serve. Before establishing the connection of a
Home Access Local Web Service of a user, sufficiently
strong authentication must be carried out.

It has the following functionality:

5   • Discovery and updating of the local network current IP
          address

        • Relaying the method requests from the Home Access Web
          Service Client to the Home Access Local Web Service.

It has the following interfaces:

10   • The Native File interface

        • The Web Service File interface

        • The IP update interface

The two first interfaces are the same as the ones defined
for the Home Access Local Service.

15   The IP update interface has the following method:

     IUpdateIP(user_id, IP address) – To update the IP address
     of the specified user

     IGetCurrentIP(user_id) – Returns the current IP address of
     the specified user

20   <u>Home Access Web Service Client</u>

     There are two types of Home Access Web Service Client:

        • Tunnelling Client

        • Reduced Mapping Client

The Tunnelling Client will use the Tunnelling Interface to
interact with either the Home Access Local Web Service or
the Home Access Global Web Service. This Client is suitable
for regular PCs. It incorporates also a CIFS server such

5   that a regular CIFS client like Windows Explorer can be
used to access the remote files and services.

The Reduced Mapping Client will use the Reduced Mapping
Interface to interact with the Home Access Local Web
Service and Home Access Global Web Service. This Client is

10   suitable for mobile devices such as mobile phones or PDA
(Personal Digital Assistant). It incorporates also a file
browser and a User interface (UI) which are designed for
devices with limited display and navigation ability.

Example

15   <u>Reduced Mapping Interface - Message Reduction</u>

As Fig. 5 displays, the Reduced Mapping Interface decreases
the number of messages travelling over the network between
the mobile device and the local network.

The previous sections of this document have described the

20   generic interfaces necessary to expose a file system on a
LAN behind a router/firewall to remote hosts through an XML
Web Service. This example details how this can be done
using the Common Internet File System (CIFS) as a network
file system on the LAN.

25   This example will provide XML Schema Definitions (XSDs) for
transforming CIFS messages into appropriate SOAP messages.

The namespace for all schemas should be
http://www.ongx.org/CIFS2XML.

<u>Common Interfaces</u>

This section defines the interfaces that are shared between
all modes of operation.

Authentication Interface

The parameters in the following messages employ the Digest
Authentication mechanisms described in RFC2617 [9]. This is
for illustrative purposes only and other (stronger)
authentication mechanisms could/should be employed. The
message exchange described below is illustrated in Figure
7.

IAUTHMustAuthenticate(Challenge)

The XSD for this message is defined in
IAUTHMustAuthenticate.xsd as (and in this case represents
the RFC2617 *WWW-Authenticate* request):

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
  <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
      <xs:element name="IAUTHMustAuthenticate">
          <xs:complexType>
              <xs:sequence>
                  <xs:element name="realm"
                  type="xs:string"/>
                  <xs:element name="nonce"
                  type="xs:string"/>
              </xs:sequence>
          </xs:complexType>
      </xs:element>
  </xs:schema>
```

IAUTHAuthenticateRequest(Credentials)

The XSD for this message is defined in
IAUTHAuthenticateRequest.xsd as (and in this case
represents the RFC2617 *Authorisation request*):

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
  <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
      <xs:element name="IAUTHAuthenticateRequest">
          <xs:complexType>
              <xs:sequence>
                  <xs:element                    name="username"
```

```
type="xs:string"/>
                                    <xs:element name="realm" type="xs:string"/>
                                    <xs:element name="nonce" type="xs:string"/>
                               <xs:element name="uri" type="xs:anyURI"/>
                               <xs:element name="response" type="xs:string"/>
                                    </xs:sequence>
                         </xs:complexType>
                    </xs:element>
               </xs:schema>
```

IAUTHAuthenticateResponse()

The XSD for this message is defined in IAUTHAuthenticateResponse.xsd as:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
     <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
          <xs:element name="IAUTHAuthenticateResponse">
               <xs:complexType>
                    <xs:sequence>
                         <xs:element name="result"
                         type="xs:boolean"/>
                         </xs:sequence>
               </xs:complexType>
          </xs:element>
     </xs:schema>
```

Tunnelling Mode

In tunnelling mode, a complete binary CIFS message is attached to a SOAP message. In addition to the binary part, the SOAP header must also be present to denote the type of attachment that is included (i.e., a CIFS message) and its identifier (according to the SOAP 1.2 with Attachments defined by World Wide Web Consortium [3]).

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
     <xs:schema  xmlns:xs="http://www.ongx.org/CIFS2XML">
               xmlns:ref="http://ws-i.org/profiles/basic/1.1/xsd"
          <xs:element name="SMBMessage">
               <xs:complexType>
                    <xs:sequence>
                         <xs:element name="message"
                         type="ref:swaRef" use="required"/>
                    </xs:sequence>
               </xs:complexType>
          </xs:element>
     </xs:schema>
```

By making the *SMBMessage* element a *complexType*, additional information can be added later on if needed.

A SOAP message with a CIFS message attached would look like this:

```
5          MIME-Version: 1.0
           Content-Type: Multipart/Related; boundary=MIME_boundary;
           type=text/xml;
                   start="<access2home.xml@ongx.org>"
           Content-Description: SOAP message with SMB message
10         attached.

           --MIME_boundary
           Content-Type: text/xml; charset=UTF-8
           Content-Transfer-Encoding: 8bit
15         Content-ID: <access2home.xml@ongx.org>

           <?xml version='1.0' ?>
           <SOAP-ENV:Envelope
           xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
20         xmlns:SMB="http://www.ongx.org/CIFS2XML"
           <SOAP-ENV:Body>
                 <SMB:SMBMessage>
                       <message>cid:SMBMessage.MobileAccess1234@ongx.o
           rg</message>
25                </SMB:SMBMessage>
           </SOAP-ENV:Body>
           </SOAP-ENV:Envelope>

           --MIME_boundary
30         Content-Type: application/octet-stream
           Content-Transfer-Encoding: binary
           Content-ID: <SMBMessage.MobileAccess1234@ongx.org>

           ...binary SMB message...
35         --MIME_boundary—
```

The cid value in the Message element refers to the Content-ID tag in the second MIME boundary, and should be unique for each SOAP message. It might be necessary to add a
40 pseudo-random value to this identifier to allow several CIFS messages to be attached to one SOAP message.

Reduced Mapping Mode

Content-type for attachments (i.e., file contents) must be application/octet-stream. In addition, the SOAP envelope
45 must contain the *real* MIME type of the file being transferred to allow proper handling of the attachment on

the receiver end (e.g. determine which program should be
used to open it). Unless this is decided based on the file
extension (e.g. *.jpg etc.).

<AttachmentRealMIMEType>image/jpeg</AttachmentRealMIMEType>

5   <... Description of each element in the messages ...>

Administration interfaces

a. IADMListHosts()

The request message in this interface must conform to
10   IADMListHostsRequest.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMListHostsRequest"/>
</xs:schema>
```

15

A response must conform to IADMListHostsResponse.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMListHostsResponse">
20          <xs:complexType>
            <xs:sequence>
                <xs:element name="host" type="xs:string"
                minOccurs="0" max="unbounded"/>
            </xs:sequence>
25          </xs:complexType>
        </xs:element>
</xs:schema>
```

b. IADMListUsers()

30

A request must conform to *IADMListUsersRequest.xsd*:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMListUsersRequest"/>
```

```
                                    </xs:schema>



A response must conform to IADMListUsersResponse.xsd:


              <?xml version="1.0" encoding="ISO-8859-1" ?>

  5        <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
                <xs:element name="IADMListUsersResponse">
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="User" type="xs:string"
 10                          minOccurs="0" max="unbounded"/>
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
           </xs:schema>
 15
```

c. IADMListDirectoriesOnHost(Host)

A request must conform to
IADMListDirectoriesOnHostRequest.xsd:

 20


```
           <?xml version="1.0" encoding="ISO-8859-1" ?>
          <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
              <xs:element name="IADMListDirectoriesOnHostRequest">
                  <xs:element name="host" type="xs:string"/>
 25           </xs:element>
          </xs:schema>
```

A response must conform to
IADMListSharesOnHostResponse.xsd:

 30
```
           <?xml version="1.0" encoding="ISO-8859-1" ?>
          <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
              <xs:element name="IADMListDirectoriesOnHostResponse">
                  <xs:complexType>
 35                  <xs:sequence>
                        <xs:element name="directory"
                        type="xs:string" minOccurs="0"
                        max="unbounded"/>
                    </xs:sequence>
 40                  </xs:complexType>
              </xs:element>
```

```
</xs:schema>
```

d. IADMSetAccessRights(URI resource, Int accessrights)

A request must conform to IADMSetAccessRightsRequest.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMSetAccessRightsRequest">
        <xs:element name="resource" type="xs:anyURI"/>
        <xs:element name="accessrights" type="xs:int"/>
    </xs:element>
</xs:schema>
```

A response must conform to IADMSetAccessRightsResponse.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMGetUserConfigurationResponse">
        <xs:element name="result" type="xs:boolean"/>
    </xs:element>
</xs:schema>
```

e. IADMGetUserConfiguration(User)

A request most conform to
IADMGetUserConfigurationRequest.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
<xs:element name="IADMGetUserConfigurationRequest">
    <xs:element name="user_id" type="xs:string"/>
</xs:element>
</xs:schema>
```

A response must conform to
IADMGetUserConfigurationResponse.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
    <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMGetUserConfigurationResponse">
            <xs:element name="configuration" type="xs:configuration"/>
        </xs:element>
</xs:schema>
```

f.   IADMSetUserConfiguration(String user_id, Configuration c)

A request most conform to
IADMSetUserConfigurationRequest.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
    <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
    <xs:element name="IADMGetUserConfigurationRequest">
            <xs:complextype>
                <xs:sequence>
                        <xs:element name="user_id" type="xs:string"/>
                            <xs:element name="configuration"
                            type="xs:configuration"/>
                    </xs:sequence>
                </xs:complextype>
            </xs:element>
</xs:schema>
```

A response must conform to
IADMGetUserConfigurationResponse.xsd:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
    <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
        <xs:element name="IADMSetUserConfigurationResponse">
                <xs:element name="result" type="xs:boolean"/>
            </xs:element>
    </xs:schema>
```

Connection Establishment, Maintenance and Teardown
interfaces

These functions are transparent to the Home Access Client,
and will be performed only by the Home Access Local Web
Service. The mapping is thus one-to-one between client
calls and file system calls. This is already discussed
above.

Resource Access interfaces

a. IACCListResources(URI uri, String pattern, Boolean recursive)

A request on this interface must conform to *IACCListResourcesRequest.xsd*:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
<xs:element name="IACCListResourcesRequest">
  <xs:complexType>
        <xs:sequence>
                    <xs:element name="uri" type="xs:anyURI"/>
                    <xs:element name="pattern"
                    type="xs:string"/>
                    <xs:element name="recursive"
                    type="xs:boolean"/>
        </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>
```

A response on this interface must conform to *IACCListResourcesResponse.xsd*:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
<xs:element name="IACCListResourcesResponse">
  <xs:complexType>
        <xs:sequence>
                    <xs:element name="resource"
                    type="xs:string" minOccurs="0"
                    max="unbounded"/>
        </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>
```

b. IACCReadResource(URI uri)

A request on this interface must conform to *IACCReadResourceRequest.xsd*:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML"
<xs:element name="IACCReadResourceRequest">
  <xs:complexType>
        <xs:sequence>
                    <xs:element name="uri" type="xs:anyURI"/>
        </xs:sequence>
  </xs:complexType>
</xs:element>
</xs:schema>
```

A response on this interface must conform to *IACCReadResourceResponse.xsd*:

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML"
            xmlns:ref="http://ws-
        i.org/profiles/basic/1.1/xsd">
```

```
            <xs:element name="IACCReadResourceResponse">
              <xs:complexType>
                  <xs:sequence>
                              <xs:element name="resource"
                              type="ref:swaRef" use="required"/>
                  </xs:sequence>
              </xs:complexType>
            </xs:element>
        </xs:schema>
```

c. IACCWriteResource(URI uri, WriteSpecification ws)

```
            <?xml version="1.0" encoding="ISO-8859-1" ?>
            <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
            <xs:element name="IACCWriteResourceRequest">
              <xs:complexType>
                  <xs:sequence>
                              <xs:element name="uri" type="xs:anyURI"/>
                              <xs:element name="writespecification"
                              type="xs:writespecification"/>
                  </xs:sequence>
              </xs:complexType>
            </xs:element>
        </xs:schema>
```

A response on this interface must conform to
IACCListResourcesResponse.xsd:

```
            <?xml version="1.0" encoding="ISO-8859-1" ?>
            <xs:schema xmlns:xs="http://www.ongx.org/CIFS2XML">
            <xs:element name="IACCWriteResourceResponse">
              <xs:complexType>
                  <xs:sequence>
                              <xs:element name="writeresult"
                              type="xs:boolean"/>
                  </xs:sequence>
              </xs:complexType>
            </xs:element>
        </xs:schema>
```

Information sources included by reference

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http://www.ietf.org/rfc/rfc2617.txt?number=2617

Claims

1. A method for providing access to services and files on a computer (4) in a local network (1) from a stationary or mobile device (8, 9) outside said local network, said local
5   network being equipped with a networked file system, and said stationary or mobile device (8, 9) being able to communicate with said local network over a wide area network,
    c h a r a c t e r i z e d   i n that
10 for any networked file system message that is to be transmitted over said wide area network mapping at least some fields of said networked file system message into corresponding fields in an XML message representing said networked system message, and
15 for any XML message received over said wide area network parsing said XML message, and if said XML message represents a networked file system message reconstructing a networked file system message by mapping each field of said XML message into a corresponding field of said
20 reconstructed networked file message.

2. A method as claimed in claim 1,
    c h a r a c t e r i z e d   i n that said XML message being a SOAP message.

3. A method as claimed in claim 1,
25 c h a r a c t e r i z e d   i n said stationary or mobile device supporting a reduced set of XML format messages, and only the most important parts of the networked file system messages.

4. A method as claimed in claim 1,
30 c h a r a c t e r i z e d   i n mapping said networked file system messages into XML format messages using XML Schema Definitions.

5.   A method as claimed in claim 1,
c h a r a c t e r i z e d   i n   providing file content in
application/octet-stream format.

6.   A method as claimed in claim 1,
c h a r a c t e r i z e d   i n   providing information regarding
the MIME type of a file being transferred.

7.   A device for providing access to services and files on
a computer (4) in a local network (1), from a stationary or
mobile device (8, 9) outside said local network, said local
network being equipped with a networked file system, and
said stationary or mobile device (8, 9) being connected to
said local network (1) over a wide area network,
c h a r a c t e r i z e d   i n   that said device being adapted to
map at least some fields of a networked file system message
to be transmitted over said wide area network into
corresponding fields in an XML message representing said
networked file system message,
said device further being adapted to parse a XML message
received over said wide area network, and if said XML
message represents a networked file system message to
reconstruct a networked file system message by mapping each
field of said XML message into a corresponding field of
said reconstructed networked file message.

8.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said device being installed
in the local network (1) as a Home Access Local Web service
(5).

9.   A device as claimed in claim 8,
c h a r a c t e r i z e d   i n   that said device being installed
on said stationary or mobile device (8, 9) as a Home Access
Web Services Client (7), said Home Access Web Services
Client (7) being adapted to interact with said Home Access
Local Web service (5) to access files and services on the
local network (1).

10.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said XML message being a
SOAP message.

11.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said stationary or mobile
device supporting a reduced set of XML format messages, and
only the most important parts of the networked file system
messages.

12.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that XML Schema Definitions are
used for mapping networked file system messages into XML
format messages.

13.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said device being adapted to
provide file content of application/octet-stream format.

14.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said device being adapted to
provide information regarding the MIME type of a file being
transferred.

15.   A device as claimed in claim 7,
c h a r a c t e r i z e d   i n   that said networked file system
being a Sun Network File System or a Common Internet File
System.

16.   A device as claimed in claim 9,
c h a r a c t e r i z e d   i n   a Home Access Global Web Service
·(6) addressable by a global IP address, said Home Access
Global Web Service (6) being adapted to hold the current IP
address of the local network (1).

17.   A device as claimed in claim 16,
c h a r a c t e r i z e d   i n   the Home Access Global Web
Service (6) being adapted to relay method requests from the

Home Access Web Services Client (7) to the Home Access
Local Web Service (5).

18. A device as claimed in claim 16,
c h a r a c t e r i z e d i n that said Home Access Local Web
Service (5) being adapted to communicate with the Home
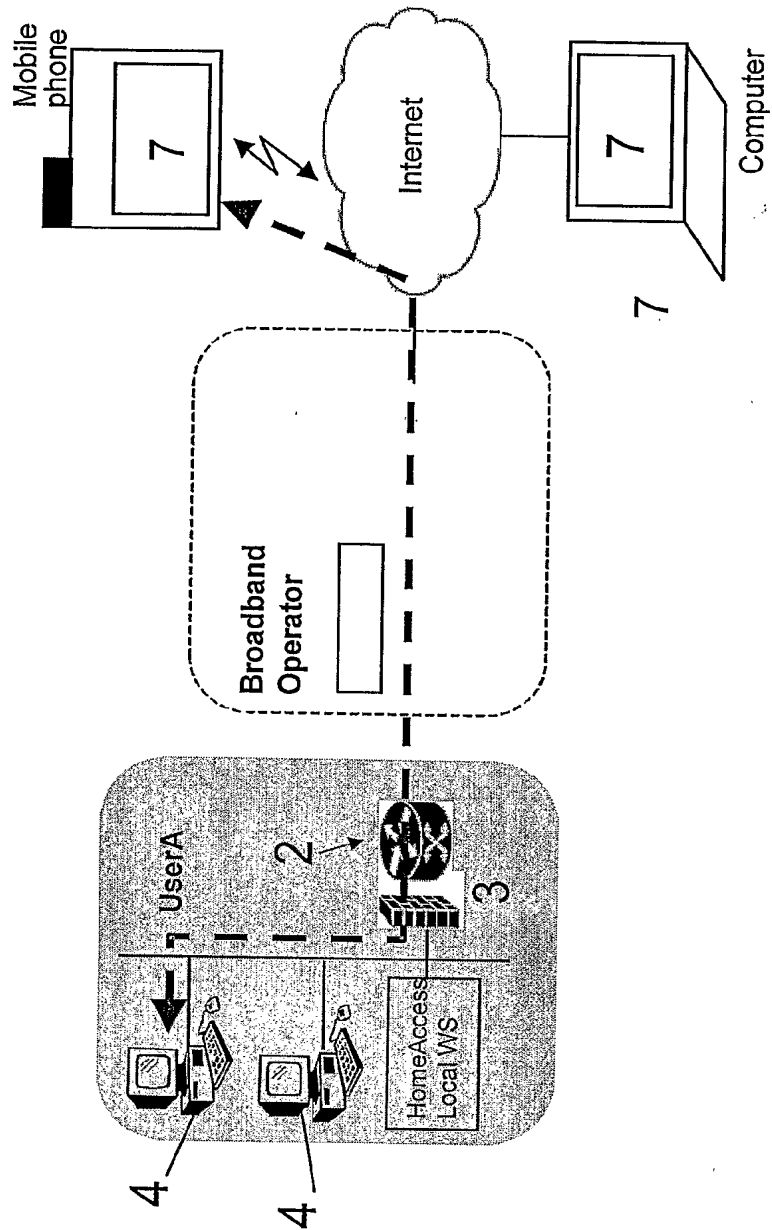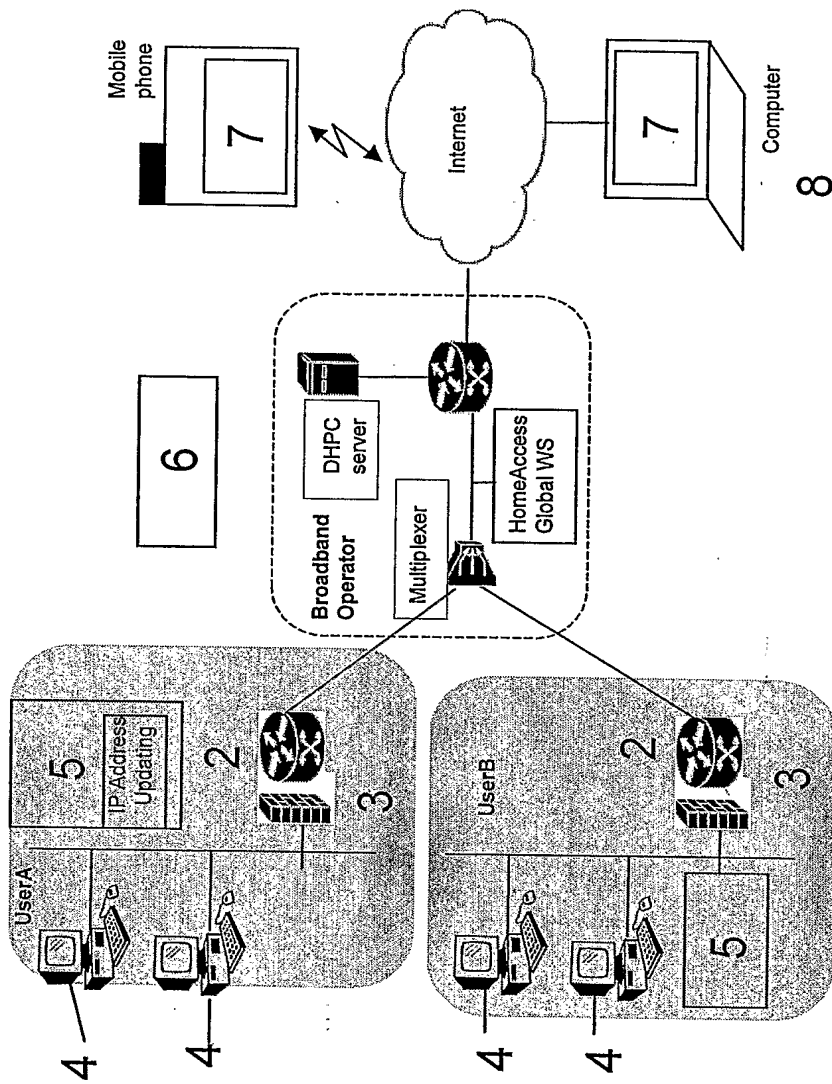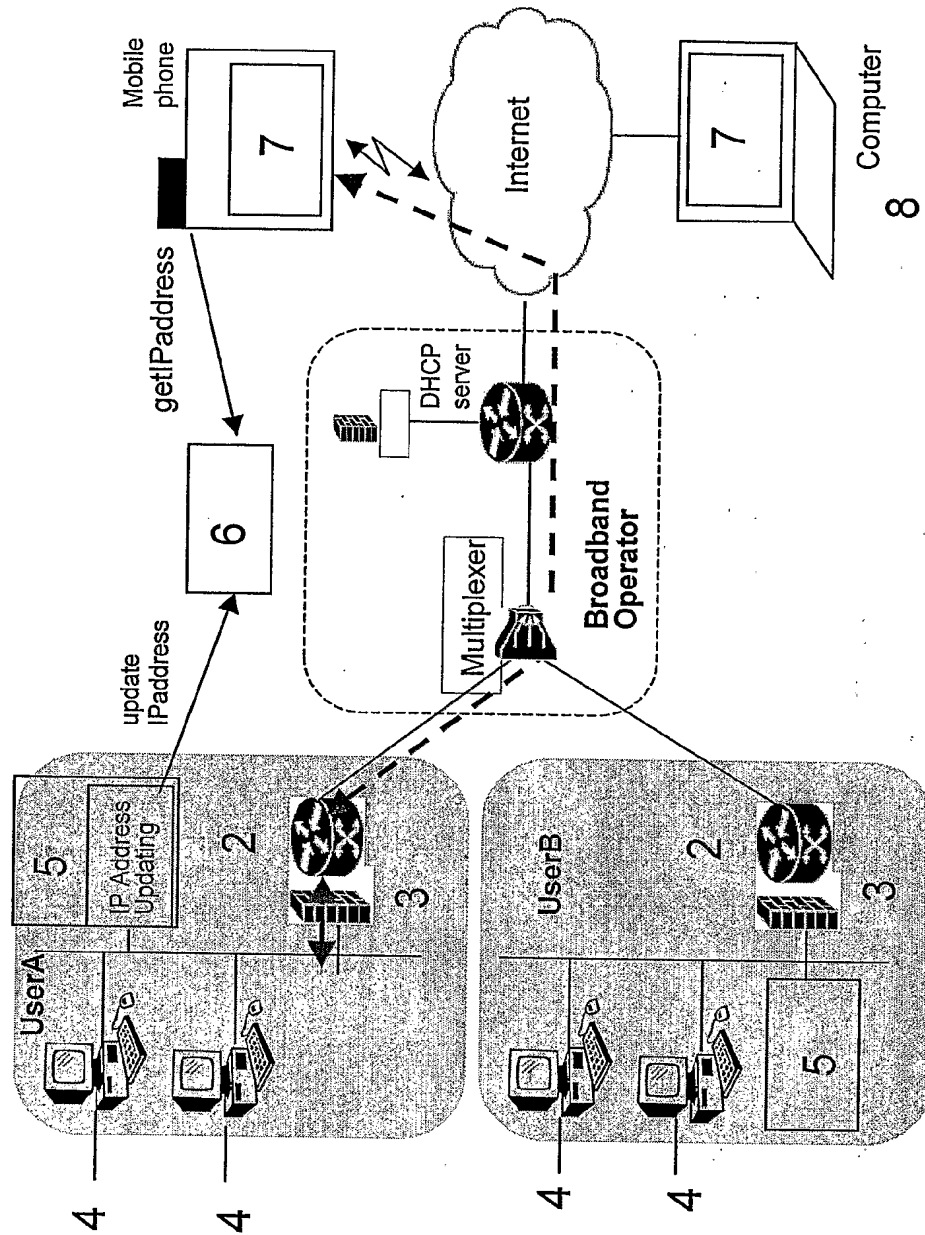Access Global Web Service (6) and update its current IP
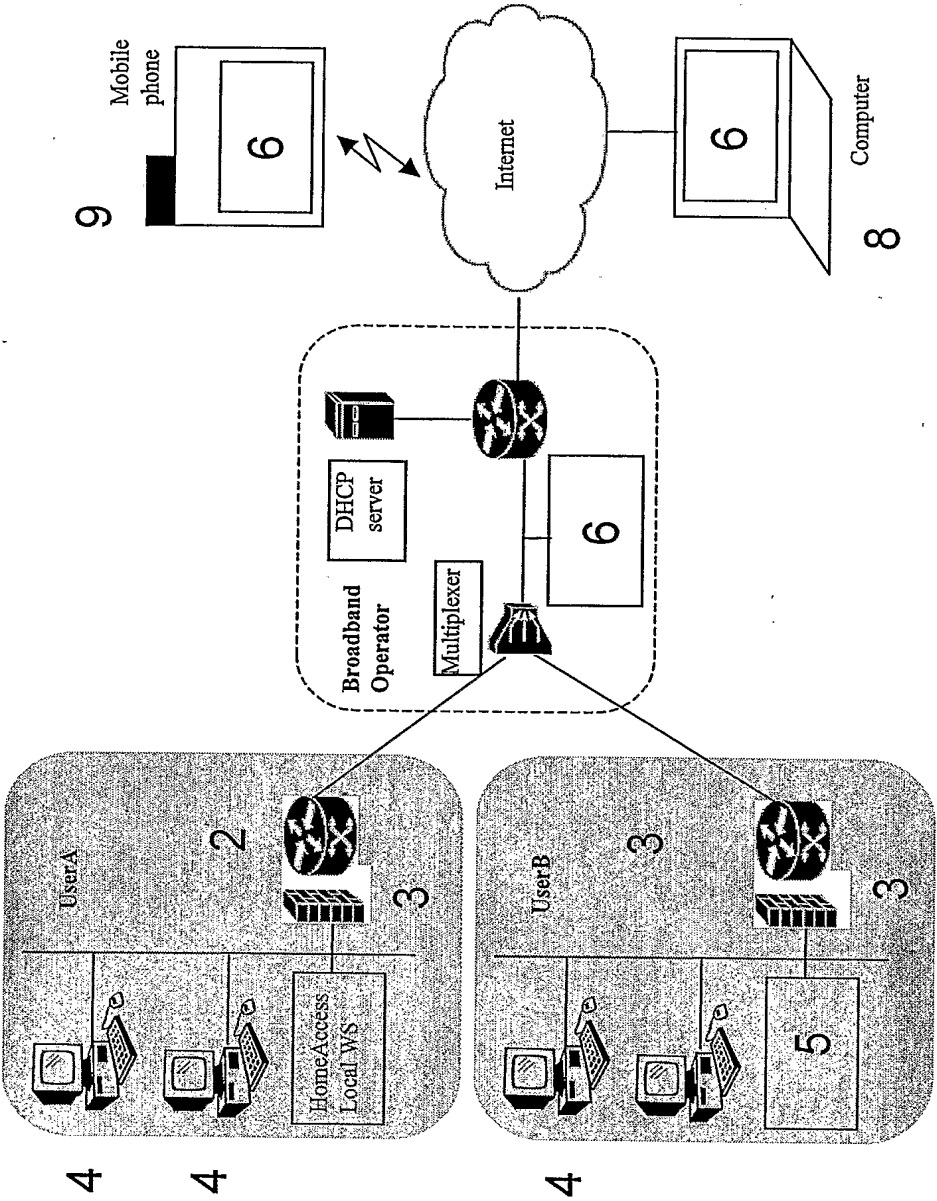address.

Figure 1

Figure 2

Figure 3

Figure 4
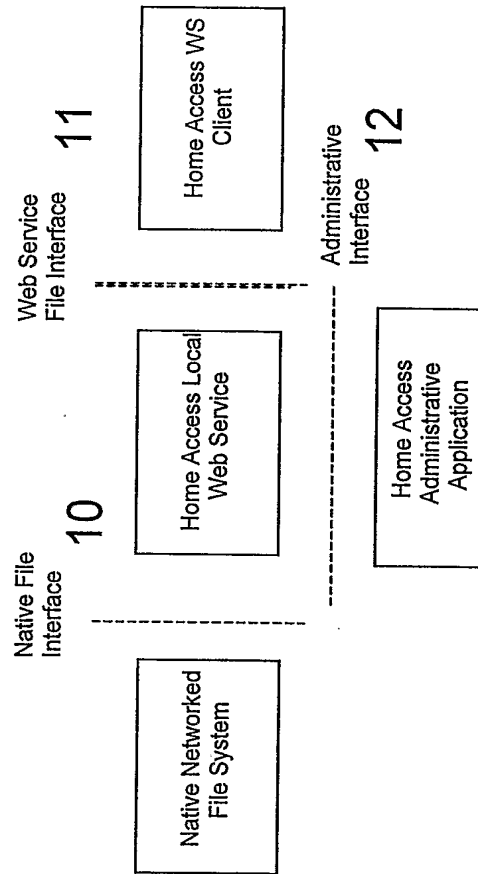
Figure 5
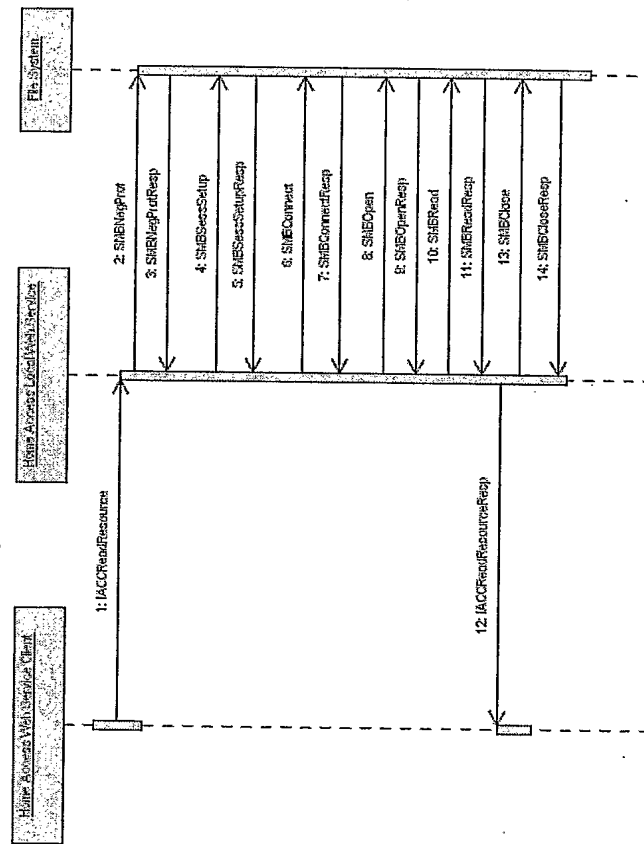
Figure 6
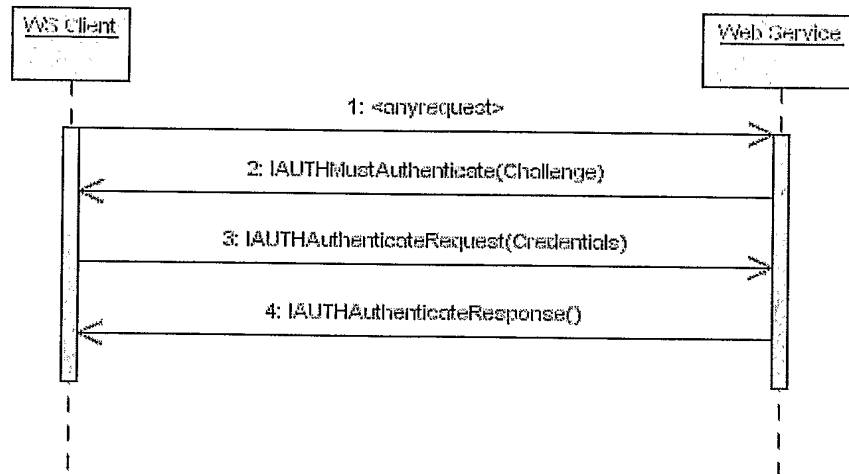
Figure 7

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06 H04L29/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/255048 A1 (LEV RAN ETAI ET AL) 16 December 2004 (2004-12-16) figures 1-4 paragraph [0243] - paragraph [0249] paragraph [0449] - paragraph [0450] paragraph [0465] - paragraph [0466] paragraph [0486] - paragraph [0488]	1-18
A	US 2002/032725 A1 (ARAUJO KENNETH S ET AL) 14 March 2002 (2002-03-14) figures 1,5-7,19 paragraph [0123] - paragraph [0126] paragraph [0129] - paragraph [0133]	1,7

-/--

[X] Further documents are listed in the continuation of Box C.   [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 May 2006	01/06/2006

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Authorized officer Tyszka, K

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	DO VAN THANH, IVAR JORSTAD, DO VAN THUAN: "Fetching home music — Sending photos home" TELEKTRONIKK 3_4.2005, [Online] 2005, pages 123–130, XP002381495 Retrieved from the Internet: URL:http://www.telenor.com/telektronikk/volumes/index.php?page=ing&id1=67&id2=175&id3=879&select=05-09> [retrieved on 2006-05-18] the whole document —————	1–4, 7–12, 15–18

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004255048 A1	16-12-2004	NONE	
US 2002032725 A1	14-03-2002	US 2001047406 A1	29-11-2001

DERWENT-ACC-NO: 2006-766876

DERWENT-WEEK: 200802

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TITLE: Method of providing access to service and files on computer, involves reconstructing network file system message, by mapping each fields of extensible markup language message into corresponding field of network file message

INVENTOR: DO T V; JORSTAD I ; VAN THANH D ; VAN THUAN D

PATENT-ASSIGNEE: TELENOR ASA[TELEN]

PRIORITY-DATA: 2005NO-001487 (March 21, 2005)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
WO 2006101402 A1	September 28, 2006	EN
NO 200501487 A	September 22, 2006	NO
NO 323214 B1	January 29, 2007	NO
EP 1867128 A1	December 19, 2007	EN

DESIGNATED-STATES: AE AG AL AM AT AU AZ BA BB BG BR
BW BY BZ CA CH CN CO CR CU CZ DE
DK DM DZ EC EE EG ES FI GB GD GE GH
GM HR HU ID IL IN IS JP KE KG KM KN
KP KR KZ LC LK LR LS LT LU LV LY MA
MD MG MK MN MW MX MZ NA NG NI
NO NZ O M PG PH PL PT RO RU SC SD SE
SG SK SL SM SY TJ TM TN TR TT TZ UA
UG US UZ VC VN YU ZA ZM ZW AT BE
BG BW CH CY CZ DE DK EA EE ES FI FR
GB GH GM GR HU IE IS IT KE LS LT LU
LV MC MW MZ NA NL OA PL PT RO SD
SE SI SK SL SZ TR TZ UG ZM ZW AT BE
BG CH CY CZ DE D K EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO
SE SI SK TR

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO2006101402A1	N/A	2006WO-NO000108	March 21, 2006
NO 200501487A	N/A	2005NO-001487	March 21, 2005
NO 323214B1	N/A	2005NO-001487	March 21, 2005
EP 1867128A1	N/A	2006EP-716777	March 21, 2006
EP 1867128A1	Based on	2006WO-NO000108	March 21, 2006

INT-CL-CURRENT:

TYPE	IPC DATE
CIPP	H04L12/66 20060101
CIPP	H04L12/66 20060101
CIPP	H04L29/06 20060101
CIPS	H04L29/08 20060101
CIPS	H04L29/10 20060101
CIPS	H04L29/10 20060101
CIPS	H04Q7/24 20060101
CIPS	H04Q7/24 20060101

ABSTRACTED-PUB-NO: WO 2006101402 A1

BASIC-ABSTRACT:

NOVELTY - The method involves mapping fields of network file system message into corresponding fields in an extensible markup language (XML) message representing the network system message, for any network file system message that is to be transmitted over wide area network. The XML message received over wide area network is parsed, and network file system message is reconstructed, by mapping each fields of XML message into corresponding field of reconstructed network file message, if XML message represents network file system message.

DESCRIPTION - An INDEPENDENT CLAIM is included for device for providing access to service and files on computer.

USE - For providing access to service and files on computer, from remote computer, personal digital assistant (PDA) and mobile phone.

ADVANTAGE - The method allows several computers on the local area network to provide services, thus every person having their own computer can access their personal services from their mobile device.

DESCRIPTION OF DRAWING(S) - The figure shows an explanatory

drawing of the local area network.

local area network (1)

broadband router (2)

firewall (3)

computers (4)

client (7)

CHOSEN-DRAWING: Dwg.2/7

TITLE-TERMS: METHOD ACCESS SERVICE FILE
COMPUTER RECONSTRUCT NETWORK
SYSTEM MESSAGE MAP FIELD EXTEND
LANGUAGE CORRESPOND

DERWENT-CLASS: T01

EPI-CODES: T01-N02B1;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 2006-594164